Modeling Software to Support Indigenous Participation in Impact Assessment

Introduction

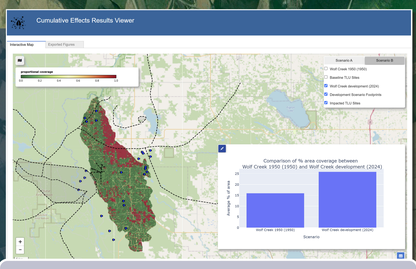
Environmental Impact Assessments (EIAs) are one of the few formal processes through which Indigenous communities can respond to development proposals and raise concerns about environmental and cultural impacts. However, EIAs typically focus on individual projects and rely heavily on Western scientific approaches. This often limits the inclusion of Indigenous knowledge and overlooks the cumulative effects of long-term, overlapping development on traditional lands. These constraints can hinder meaningful participation, especially for communities with limited capacity. To help address these challenges, we developed a web-based cumulative effects assessment (CEA) tool that supports community-led evaluations of development proposals within a broader landscape and historical context.

Purpose & Context

The CEA tool was designed to help Indigenous communities assess both individual projects and long-term cumulative landscape changes within their territories. By comparing current conditions and proposed development projects to precolonial or historical baselines, the tool enables users to identify how multiple overlapping activities—such as oil and gas development, forestry, and infrastructure expansion— affect land access, ecosystem health, and opportunities for Indigenous land use over time. This supports more informed and strategic participation in impact assessment and land-use planning processes.

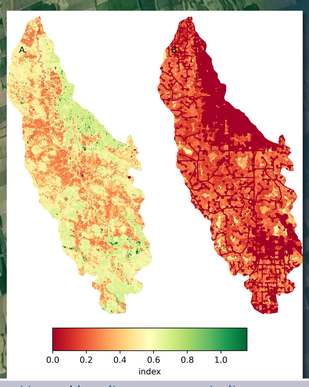
Tool Overview

Developed using the ALCES Flow platform, the CEA tool allows users to simulate land cover changes over time and assess impacts on ecological and cultural indicators. Users begin by selecting a study area (e.g., a watershed or traditional territory), then uploading proposed projects and selecting relevant indicators—such as wildlife habitat or Indigenous land use opportunity. The tool compares indicator outcomes across three time periods: natural (precolonial), historical (1900 to current), and potential future (with proposed projects). Results are visualized through maps and graphs that show change relative to a precolonial or historical baseline. These outputs can be exported for use in technical reviews and community reports.



The CEA tool's results viewer, showing development footprint relative to a 1950 baseline and impacted TLU sites.

Key Features



Natural baseline vs current Indigenous opportunity for moose harvest

- **Accessible Workflow and User Interface:** The web-based tool is designed for non-specialist users and uses a streamlined workflow with preloaded data layers and a guided process. No GIS or modeling expertise is required.
- **Traditional Land Use (TLU) Database:** The tool has an integrated Traditional Land Use (TLU) database that allows communities to import, store, view, and assess TLU data alongside project simulations. This helps identify culturally significant areas that may be affected by proposed developments.
- **Exportable Outputs:** Maps, graphs, and tables can be easily exported to support community submissions and communications.
- **Backcast Modeling:** The tool allows users to explore the consequences of historical natural resource development by viewing the status of indicators in past decades. The indicator assessments are informed by maps of landscape composition from 1900 to 2020 that were derived using historical land cover inventories and census data.
- **Project Footprint Library:** The CEA tool enables users to import spatial layers of proposed development footprints and compile a database of proposed projects. The user can then select projects from that database to apply to simulations.

Community Benefits & Use

The CEA tool helps Indigenous communities evaluate and communicate the cumulative impacts of development in their territories from a position of informed understanding. It supports both strategic planning over decades and tactical responses to new project proposals. The tool is community-owned and designed for ongoing use beyond the initial project, with training and technical support provided. By enabling community-led cumulative effects assessments, the tool helps strengthen Indigenous participation in land-use decisions.